D.P.U. 92-2C-1

Application of Cambridge Electric Light Company, under the provisions of G.L. c. 164, § 94G, as amended by St. 1981, c. 375, and the Company's tariff, M.D.P.U. No. 215, for approval by the Department of Public Utilities of a change in the quarterly power cost charge to be billed to the Company's customers pursuant to meter readings in the billing months of October, November, and December 1992.

Application is also made by Cambridge Electric Light Company for approval by the Department of Public Utilities of rates to be paid to Qualifying Facilities for purchase of power pursuant to 220 C.M.R. §§ 8.00 et seq. and M.D.P.U. No. 212.

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FOR: CAMBRIDGE ELECTRIC LIGHT COMPANY

Petitioner

I. INTRODUCTION

On September 16, 1992, Cambridge Electric Light Company ("Cambridge" or "Company") filed with the Department of Public Utilities ("Department") a petition seeking a quarterly change to its fuel charge, in conformance with its tariff M.D.P.U. No. 252, and a change in the rates to be paid to qualifying facilities ("QF") for purchased power pursuant to 220 C.M.R. §§ 8.00 et seq., M.D.P.U. No. 251, and to the Department's rules governing such rates. The Company requested that both of these rates be effective for bills issued pursuant to meter readings in the billing months of October, November, and December 1992. The Company also notified the Department of its intent to file for review performance program data for its generating units for the July 1, 1991 through June 30, 1992 performance year. Lastly, the Company submitted generating unit performance data for the July 1, 1991 through June 30, 1992 performance year.

The Department held a public hearing on the Company's application on September 23, 1992, at the offices of the Department in Boston, Massachusetts. The hearing in this docket occurred concurrently with the hearing in D.P.U. 92-3C, Commonwealth Electric Company's fuel charge application. At the September 23 hearing, the Department extended the proceeding in order to investigate variances in actual generating unit performance from the performance goals that had been established for the Company's generating units in Cambridge

Electric Light Company, D.P.U. 91-59 (1991) ("D.P.U. 91-59").[1]

The Department conducted a hearing on generating unit performance matters on November 5, 1992. During the hearing, the Company presented one witness, David E. Carriere, manager of performance issues. In addition to the exhibits that had been entered into evidence at the September 23 hearing, the Company offered an amendment to Exhibits CEL-6 and CEL-7, which were also accepted into evidence. The Department also entered into evidence exhibits designated as DPU-1 through DPU-6.

II. PERFORMANCE REVIEW

A. Standard of Review

The Department is authorized to set a quarterly fuel charge for a company's recovery of prudently incurred costs of fuel and purchased power. G.L. c. 164, § 94G(b). To aid in determining the prudence of such costs at a later date, the Department is required to set performance goals annually for the generating units that provide electric power to jurisdictional electric companies. G.L. c. 164, § 94G(a). In these goal-setting proceedings, a company proposes targets, subject to Department review, for both individual generating units and its overall system. The Department reviews the proposed targets and issues an order establishing both unit and system-wide

[1] On September 30, 1992, the Department issued an Order in D.P.U. 92-2C establishing the Company's fuel charge for the billing months of October, November, and December 1992.

goals for the subsequent twelve-month performance period.

In particular, G.L. c. 164, § 94G states that each company

> shall describe for the time period or periods designated reasonably attainable targets which shall include a thermal efficiency target for the performance of the company.... Such program also shall provide for the efficient and cost-effective operation of individual generating units by an electric utility company in meeting the minimum needs of each unit of said company to maintain sufficient reserves of power for purposes of reliability and efficiency. Such program also shall describe the historic data, industry standards or reports, simulation models or other information and techniques upon which projections of the company's performance are based and shall include, as goals for individual and system plant performance, availability, equivalent availability, capacity factor, forced outage rate, heat rate on a unit by unit basis and such other factors or operating characteristics required by the Department. Any such program may specify a value or a range of values for the operating characteristic in question and shall reflect operating conditions when overall performance is optimized.

The availability factor ("AF") of a unit is the fraction of time during which the unit is capable of generating power at any level. AF, which is expressed as a percentage, measures how often a unit was available to generate power, but it is not a measure of the amount of power generated. It takes into account the effect of planned outage-hours ("POH") and unplanned outage- hours ("UOH") on a unit's availability. POH are outage-hours that are scheduled well in advance of the date on which they occur. UOH comprise five categories of outage-hours. The first three categories ("UOH 1, 2, and 3"), also known as forced outage-hours ("FOH"), are outages caused by conditions that require removing a unit from service on, at most, a few days' notice. The fourth

category ("UOH 4") represents maintenance outage-hours ("MOH"), which are outages that can be delayed beyond the end of the next weekend, but that take a unit out of service before its next planned outage. In the fifth category ("UOH 5") are outage-hours that extend a planned outage beyond its scheduled duration. The formula for AF is a ratio of period hours ("PH"), less POH and UOH, to PH; that is

$$AF = \frac{PH - POH - UOH}{PH}$$

The equivalent availability factor ("EAF") of a unit is the fraction of maximum generation that a unit would be able to produce if limited only by outages and deratings. Deratings are reductions in a unit's maximum power level. They can result from either unit conditions, such as equipment limitations, or seasonal conditions, such as ambient water temperature or environmental restrictions. EAF, expressed as a percentage, differs from AF in that EAF takes into account equivalent unit derated hours ("EUNDH") and equivalent seasonal derated hours ("ESDH"). EUNDH comprises equivalent planned derated hours ("EPDH") and equivalent unplanned derated hours ("EUDH"). Equivalent derated hours are calculated by multiplying the duration of each derating, in hours, by the number of megawatts by which the unit is derated, and dividing the product by the maximum capacity of the unit. Gross EAF is calculated by using the gross maximum capacity of a unit to calculate equivalent derated hours, while net EAF is calculated

using equivalent derated hours based on maximum net capacity. Gross maximum capacity includes the capacity required to supply electricity to run the unit. Net maximum capacity ("NMC") is the maximum capacity available after station service requirements have been met. The formula for either net or gross EAF can be expressed as

$$EAF = \frac{PH - POH - UOH - EUNDH - ESDH}{PH}$$

Net capacity factor ("CF") is a ratio of the number of megawatthours ("MWH") a unit has generated during a period of time, in excess of station service requirements, compared to the maximum it could have generated if it had produced its net maximum capacity during the entire period. CF indicates how much power a unit generated during a given period, compared to the maximum amount of power it theoretically could have generated during that period. CF is usually expressed as

$$CF = \frac{\text{Net Actual Generation}}{NMC \times PH}$$

Forced outage rate ("FOR") measures the amount of time that a unit was completely out of service because of forced outages during a period, relative to the amount of time that the unit was actually in service during the same period. FOR takes into account the unit's FOH, but not the other types of unplanned outages. It is calculated by dividing FOH by the sum of FOH and service hours ("SH"). A unit's SH

are the hours in a given period during which the unit was in service generating electricity. The formula for FOR can be expressed as

$$FOR = \frac{FOH}{FOH + SH}$$

Heat rate ("HR") compares the fuel energy consumed by a unit during a given period, expressed in British Thermal Units ("BTU"), to the electrical generation of the unit, in kilowatthours ("KWH"), during the same period. HR is a measure of a unit's thermal efficiency. HR is usually expressed as

$$HR = \frac{\text{Fuel Energy Consumed}}{\text{Net Actual Generation}}$$

In accordance with G.L. c. 164, § 94G, the Department conducts annual goal-setting proceedings with each electric company over which it has such authority. In these proceedings, the performance programs submitted by a company are reviewed and goals are developed for AF, EAF, CF, FOR, and HR based on the formulas described above. At the conclusion of goal-setting proceedings, the Department issues an order that establishes both unit and system-wide goals for a subsequent twelve-month performance period.

Also in accordance with G.L. c. 164, § 94G, the Department conducts annual performance review proceedings wherein actual performance data obtained during a company's performance period are reviewed and compared to the goals that had been set for that period in

a prior goal-setting proceeding. Should a company fail to achieve one or more of the goals established for a performance period under review, the Department conducts an investigation into the circumstances behind each failure. These investigations typically involve a detailed review of activities surrounding particular generating units in order to determine whether a company, in operating and maintaining its units, followed all reasonable or prudent practices consistent with the provisions of the statute.

In assessing the reasonableness or prudence of company performance, the Department must follow the statutory standard of viewing company performance "in light of the facts which were known or should reasonably have been known by the company at the time of the actions in question." G.L. c. 164, § 94G(a). If the Department finds that company actions were unreasonable or imprudent, "it shall deduct" from the next quarter's fuel charge an amount "determined to be directly attributable to the unreasonable or imprudent performance." Id. However, a company's failure to achieve a particular goal does not result in an automatic penalty.

The Department's standard for determining the prudence of a company's actions appears in G.L. c. 164, § 94G.[2] If a company expects

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[2] "The statutory context... is provided by the authority granted the Department in G.L. c. 164, § 94G(a), to deduct from a fuel charge proposed for the next quarter the amount of those fuel costs determined to be directly attributable to a company's unreasonable (continued...)

to recover its costs, including its replacement power costs incurred as a result of unit outages, the company must "demonstrate the reasonableness of energy expenses sought to be recovered through the fuel charge." G.L. c. 164, § 94G(b). The Department is directed to disallow such costs if (a) the company fails to sustain its burden of proof that its actions were prudent, or (b) despite the company's making a prima facie case, the Department concludes that the company's actions were directly attruibutable to the unreasonable or imprudent performance whose recovery is sought.[3] G.L. c. 164, § 94G(a).

A performance review addresses the performance of a company's units during the performance year. The performance of certain units in which that company has contractual rights to capacity or output, rather than ownership interests, is, in the first instance, the proper subject of other docket inquiries. In keeping with established precedent, should it

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[2](...continued)
or imprudent performance; and, in § 94G(b), to deduct that amount determined to be directly attributable to a company's defective operation of a unit. Each determination is to be made in light of the facts which the company knew or should reasonably have known at the time of the actions in questions." Boston Edison Company v. Department of Public Utilities, 393 Mass. 244, 245 (1984).

[3] For the purposes of this proceeding, incremental replacement power costs are the difference between the fuel and operating costs to replace a unit that is not available for service during a given period, and the fuel and operating costs that would have been incurred had that unit been fully operational during the period.

be determined in other inquiries that imprudent or unreasonable actions resulted in lost availability of units from which a company also received power, the Department may disallow the recovery of resultant incremental replacement power costs incurred by that company, in order to protect ratepayers from the adverse consequences of any imprudence. Commonwealth Electric Company v. Department of Public Utilities, 397 Mass. 361, 366 n.2 (1986).

Since 1985, the Department has held that a company must refund to ratepayers incremental replacement power costs that result from imprudence committed by its independent contractors to whom the company delegates the responsibility for repair work. Boston Edison Company, D.P.U. 88-1A-A, at 51 (1988); Boston Edison Company, D.P.U. 85-1B-2, at 15-18 (1985); Western Massachusetts Electric Company, D.P.U. 85-8F-2, at 12-13 (1985). A company may not insulate itself from responsibility for the conduct of its business by engaging contractors. Section 94G of G.L. c. 164 applies with equal force to a company's independent contractors on the principle that providing electric service is part of an electric company's "nondelegable statutory obligations." Commonwealth Electric Company v. Department of Public Utilities, 397 Mass. 361, 366 n.2 (1986).

B. Overview

The Department sets goals for units which a company owns and operates, units in which a company has an ownership interest but does

not operate, and units from which power is received under life-of-the-unit contracts. In D.P.U. 91-59, the Department approved performance goals for eight units which Cambridge owns and operates, including Kendall Units 1, 2, and 3 ("Kendall 1, 2, and 3"); two jet units at Kendall Station; and Blackstone Units 1, 3, and 4 (Blackstone 1, 3, and 4"). The Department also set goals for Canal 1 and 2, which are operated by Canal, and from which the Company receives power under life-of-the-unit contracts.

Cambridge owns 4.5 percent of the Connecticut Yankee Atomic Power Company, which operates the Connecticut Yankee nuclear generating unit ("Connecticut Yankee"). The Company also owns 4 percent of the Maine Yankee Atomic Power Company, which operates the Maine Yankee nuclear generating unit ("Maine Yankee"); 2.5 percent of the Vermont Yankee Nuclear Power Corporation, which operates the Vermont Yankee nuclear generating unit ("Vermont Yankee"); and 2 percent of the Yankee Atomic Electric Company, which operates the Massachusetts (Rowe) Yankee nuclear generating unit ("Yankee Rowe"). Cambridge is entitled to shares of the output from each of these units in proportion to its ownership shares, with the exception of Yankee Rowe, which was retired on February 26, 1992.

Kendall 1, 2, and 3 are oil-fired steam-electric units, with nominal capacities of 17 MW, 21 MW, and 26 MW, respectively. Blackstone 1, 3, and 4 are also oil-fired steam units, with nominal capacities of 15

MW, 2 MW, and 2.5 MW, respectively. Canal 1 and 2 are also oil-fired steam units. Canal 1 has a capacity of 564 MW, while Canal 2 has a capacity of 580 MW. The two Kendall jets are rated at 20 MW each.

In D.P.U. 91-59 the Department set goals for units in which Cambridge had entitlements to power through three system contracts that Canal has with Northeast Utilities ("NU"). These include a 5-year "Slice-of-System" contract, a "First Retirement 528 Line" contract, and a "Second Retirement 545 Line" contract. These contracts entitled Cambridge to power from: Millstone 1, 2, and 3; Middletown 1, 3, and 4; Montville 6; Norwalk Harbor 1 and 2; Northfield 1, 2, 3, and 4; South Meadow 11, 12, 13, and 14; Cos Cob 10, 11, and 12; Devon 3, 4, 5, and 6; West Springfield 1 and 2; Franklin Drive 10; and Doreen. During the performance year, the Company also received power from Seabrook, a 1,150 MW nuclear power plant operated by the New Hampshire Yankee Corporation. Cambridge purchases 19.94 percent of the 40.5 MW entitlement that Canal holds in Seabrook.

This performance review proceeding focused on the actual performance of the above units during the performance year ending June 30, 1992. As in prior years, the Company's September 1992 fuel charge filing included the actual performance data for the performance year and a brief discussion of performance-related activities. An investigation has been conducted into the discrepancies between the actual operating results achieved by Cambridge's units and the goals set

for those units in D.P.U. 91-59. In Exhibit C-6 the Company provided a comparison of the actual operating results achieved by its units to the goals set in D.P.U. 91-59, which has been reproduced as Table 1 attached to this Order.

The information in Table 1 shows that some of the Company's units did not achieve their EAF goals. Certain units also failed to meet other goals established in D.P.U. 91-59. Accordingly, the Department investigated the reported variances between the established goals and the actual performance of units in the Company's supply portfolio.

C. Performance Issues

1. Canal 1

a. Background

The Department's investigation focused on events surrounding an outage at Canal 1 that occurred between February 26, 1992 and March 6, 1992 (IR-DPU-1-3, memo dated April 2, 1992 to C.F. Collins and J.M. Powers on Canal 1 turbine vibration). Canal 1 was shut down on February 26 because of increasing vibration, which had been first noticed in January, 1992, on one of the turbine bearings (IR-DPU-1-3). According to the Company, Canal 1 had to come out of service because continued operation of the unit with the vibration problem, would of threatend the safety of personnel and equipment (id.).

Upon disassembly of the turbine, the Company discovered that the turbine vibration was caused by the failure of 5 out of 16 bolts on the

coupling that joins the extension shaft to the very high pressure ("VHP")/ high pressure ("HP") turbine rotor (id.). The extension shaft drives a boiler feed pump (id., report prepared by Thielsch Engineering Associates dated June 5, 1992, at 1). A review of the history of the extension shaft from January, 1988 to January, 1992 indicated no vibration problems had been evidenced during that period (id.).

According to a memo drafted by Robert Fife, ComElectrics director of production services, the primary reason that the extension shaft coupling failed was because of the way Westinghouse had assembled the coupling (IR-DPU-1-3, memo dated March 20, 1992 to H. Scherer, Jr., regarding Canal 1 extension shaft). Thielsch Engineering Associates, who were hired by ComElectric to determine the cause of the extension shaft failure, found that "[t]he fatigue failure was due to excessive loading of the threaded portion of the studs as a result of improper alignment of the coupling" (id., report prepared by Thielsch Engineering Associates dated June 5, 1992, at 10).

However, the Company's witness, Mr. Carriere, asserted that the extension-shaft failure was not caused by Westinghouse's coupling assembly (Tr. 2, at 33-35). Mr. Carriere stated that the Company performed detailed vibration analyses on Canal 1 in July of 1991, November of 1991, and again in January of 1992. According to Mr. Carriere, none of these vibration analyses indicated any misalignment of the extension shaft to the VHP/HP turbine (id.).

In addition, after a review of the bolt failure by its engineering group, Westinghouse determined that the failure was not caused by the improper assembly of the extension shaft coupling. Instead, Westinghouse concluded that the failure was caused by the use of undersized bolts that allowed the bolt holes in the coupling to be misaligned (IR-DPU-3 Supplemental, Westinghouse letter dated May 12, 1993 from A.J. Sullivan to Mr. Carriere).

b. Analysis and Findings

The record is clear that excessive vibration occurred at Canal 1 because of the failure of 5 out of 16 bolts on the coupling that joins the extension shaft to the VHP/HP turbine, and that this failure resulted in a eight-day outage. However, the Record does not establish the root cause of the bolt failure. During the hearing, two possible reasons as to why five of the coupling bolts failed were discussed including (1) the possibility that Westinghouse assembled the coupling improperly creating a misalignment, and (2) the possibility that undersized bolts were fitted into the coupling allowing it to be misaligned. The Department finds that either of these two possibilities would have been imprudent.

Based on the record in this proceeding, the Department finds that the Company failed to demonstrate that the Company and its contractor made all reasonable and prudent efforts consistent with accepted management practices in order to avoid the failure of the

bolts.

Where a company fails to establish the reasonableness of its actions, the Department must disallow recovery of replacement power costs. Boston Edison Company, D.P.U. 88-1A-A, at 51 (1988); Boston Edison Company, D.P.U. 85-1B-2, at 15-18 (1985); Western Massachusetts Electric Company, D.P.U. 85-8F-2, at 12-13 (1985). Therefore, the Department finds that the February 26 through March 6, 1992 outage resulted from actions that the Company failed to establish as reasonable.

Consistent with Department's standard regarding imputed imprudence, it is not necessary to determine whether the Company or its contractor actually committed the mistake (see Section II.A, above). The Department finds that ratepayers should not bear the costs of the Company's imprudent actions and, therefore, directs the Company to calculate the incremental replacement power costs and interest associated with the February 26 forced outage at Canal 1, and to provide such calculation to the Department in the next fuel charge filing for the refund.

2. Other Units

During the course of this investigation, the Department also reviewed data and exhibits submitted concerning other major and minor units for which goals were established in D.P.U. 91-59. Other than the outage at Canal 1 discussed above, there is no evidence that

any outage during the performance year resulted from imprudent action by Cambridge personnel or its contractors.

III. ORDER

Accordingly, after due notice, public hearing and consideration, it is

ORDERED: That all incremental replacement power costs incurred by Cambridge Electric Light Company attributable to the forced outage at Canal 1 between February 26, 1992 and March 6, 1992, as described herein, be and hereby are disallowed.

By Order of the Department,

_____
Kenneth Gordon, Chairman

_____
Mary Clark Webster, Commissioner

Appeal as to matters of law from any final decision, order or ruling of the Commission may be taken to the Supreme Judicial Court by an aggrieved party in interest by the filing of a written petition praying that the Order of the Commission be modified or set aside in whole or in part.

Such petition for appeal shall be filed with the Secretary of the Commission within twenty days after the date of service of the decision, order or ruling of the Commission, or within such further time as the Commission may allow upon request filed prior to the expiration of twenty days after the date of service of said decision, order or ruling. Within ten days after such petition has been filed, the appealing party shall enter the appeal in the Supreme Judicial Court sitting in Suffolk County by filing a copy thereof with the Clerk of said Court. (Sec. 5, Chapter 25, G.L. Ter. Ed., as most recently amended by Chapter 485 of the Acts of 1971).

TABLE 1
CAMBRIDGE ELECTRIC LIGHT COMPANY
ACTUAL PERFORMANCE RESULTS COMPARED TO GOALS
JULY 1, 1991 - JUNE 30, 1992